

REMARKS

Applicant respectfully requests reconsideration. Claims 1, 12-16, 19-22, 30, 39-43 and 45-47 are pending in this application. Claims 1, 12-16, 19-22, 39-42 and 45-57 were withdrawn from consideration. Claims 30 and 43 remain pending for examination.

Rejection of Claims 30 and 43

Claims 30 and 43 were rejected under 35 USC §103 as being unpatentable over WO98/44569 (Ito) in view of US Patent No. 6,589,335 (Bulsara).

The Office Action appears to take the position that it would have been obvious to modify Ito to include a silicon substrate and a SiGe layer, as taught by Bulsara.

However, Ito includes a direct teaching away from such modification. Specifically, Ito states that the substrate “*needs to be transparent* to light emitted from the light emitter to be obtained.” (Emphasis added). (See Ito, Col. 3, lines 40-45). As known to those of ordinary skill in the art, gallium nitride materials emit light having wavelengths in the green-blue to UV region of the spectrum. Those of ordinary skill in the art also know that a silicon substrate is *not transparent* to light having such wavelengths, but rather strongly absorbs such light. Applicant has attached an Appendix A which supports the previous statement. Appendix A includes a graph that shows the absorption coefficient versus photon energy (bottom scale) and light wavelength (top scale) which is based on FIG. 27 on p. 42 of Sze, S.M., Physics of Semiconductor Devices 2nd Edition, John Wiley and Sons, N.Y. 1981. As shown by the horizontal dashed line, the absorption coefficient is very large ($>10^4$ /cm) within the green-blue to UV portion of the spectrum which is representative of light emitted by III-nitride materials. For example, for light having a wavelength of 550 nm, the transmission through a 100 micron thick silicon substrate is on the order of 0.005% which clearly is extremely small.

The Office Action suggests that light can be emitted through the top surface of the LED shown in FIGS. 1A and 1B in Ito and, thus, suggests that the relative transparency of the substrate material does not matter. However, Ito teaches otherwise in connection with this embodiment. For example, for the LED shown in FIGS. 1A and 1B, Ito explains that emitted light is absorbed by the

substrate when the substrate is not formed of a transparent material (under "Embodiment 1" heading; Column 9, lines 42-51).

Thus, one of ordinary skill in the art would not have been motivated to modify the structure in Ito that includes a gallium nitride material to include a silicon substrate because such substrate would limit desirable light emission. Thus, claim 30 is not obvious in view of the combination of Ito in view of Bulsara. Claim 43 depends from claim 30 and, thus, is also not obvious in view of this combination.

Accordingly, Applicant respectfully requests withdrawal of the claim rejections on this ground.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

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